The active blind spot camera: hard real-time recognition of moving objects from a moving camera

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Abstract This PhD research focuses on visual object recognition under specific demanding conditions. The object to be recognized as well as the camera move, and the time available for the recognition task is extremely short. This generic problem is applied here on a specific problem: the active blind spot camera. Statistics show a large number of accidents with trucks are related to the so-called blind spot, the area around the vehicle in which vulnerable road users are hard to perceive by the truck driver. A simple solution as the blind spot mirrors now enforced by EU-law show no decrease of the number of accidents per year. Other technological solutions (e.g. ultrasonic sensors or infrared systems) all have their specific disadvantages, and thus are far from the perfect solution. Another solution must be found, in which a detection system actively warns the driver. The purpose of this PhD research therefore is the realization of an active blind spot camera, which can detect vulnerable road users in the camera image using image processing, and warns the driver about this. This research subject poses a number of challenges. The very small time margin available contradicts with the very high reliability requirement. Moreover, time-efficient recognition of a heterogeneous object class is challenging. Since the final system should be integrated in existing passive blind spot camera systems, the computational resources are limited. Also, the specific sideways-looking blind spot camera position differs significantly from the often-described forward looking pedestrian detection systems. Currently we achieved part of this total safety solution: we developed a robust multi-pedestrian detection and tracking framework, relying solely on the vision input from the truck's blind spot camera. Our algorithm exploits scene constraints and temporal information to reduce the search space. This approach allows the use of an accurate pedestrian detector which would otherwise be too computationally expensive. Using this approach we achieve excellent accuracy results at high processing speeds, while only relying on a single core CPU implementation.

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